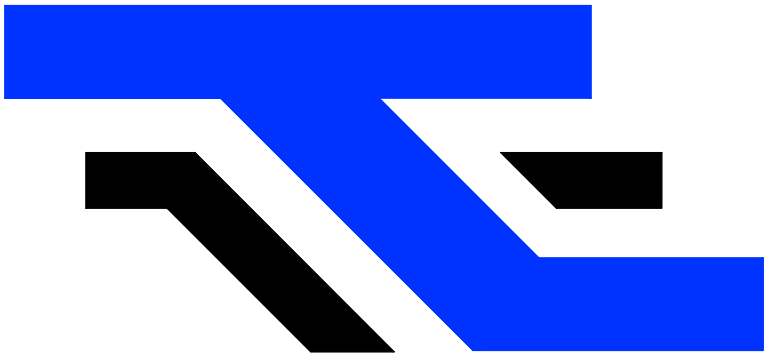

Chapter 1
Technology Education in Missouri

MISSOURI TECHNOLOGY EDUCATION GUIDE
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Technology Education in Missouri

1. Introduction

Technology has been going on since humans first formed a blade from a piece of flint, harnessed fire, or dragged a sharp stick across the ground to create a furrow for planting seeds, but today it exists to a degree unprecedented in history. Planes, trains, and automobiles carry people and cargo from place to place at high speeds. Telephones, television, and computer networks help people communicate with others across the street or around the world. Medical technologies, from magnetic resonance imaging (MRI) to vaccines, help people to live longer, healthier lives. Furthermore, technology is evolving at an extraordinary rate, with new technologies being created and existing technologies being improved and extended.

Humans have been called the animals that make things, and at no time in history has that been so apparent as the present. Today, every human activity is dependent upon various tools, machines, and systems, from growing food and providing shelter to communication, healthcare, and entertainment. Some machines, like the tractor, speed up and make more efficient activities that humans have done for hundreds or thousands of years. Others, such as the airplane or the Internet, make possible things that humans have never been able to do before. This collection of devices, capabilities, and the knowledge that accompanies them is called technology.

We are a nation increasingly dependent on technology. Yet, in spite of this dependence, U.S. society is largely ignorant of the history and fundamental nature of the technology that sustains it. The result is a public that is disengaged from the decisions that are helping shape its technological future. In a country founded on democratic principles, this is a dangerous situation.

With the growing importance of technology to our society, it is vital that students receive an education that emphasizes technological literacy. (ITEA, 2000)

This chapter, as the Missouri Technology Education (TE) Guide's first, anchors the entire profession's practice. It lays the foundation upon which all subsequent chapters are built. This document, together with the national *Standards for Technological Literacy: Content for the Study of Technology*, present a vision of what students should know and be able to do in order to be technologically literate, and what school programs should be like to achieve that vision.

2. Definitions and Terms

Technology Education: The school subject that teaches about the processes used to design, create, and maintain the human-made world. (Technological studies, design and innovation, and pre-engineering are other terms used to describe this subject area).

Technology: Broadly speaking, technology is how people modify the natural world to suit their own purposes. From the Greek word *techne*, meaning art or artifice or craft, technology literally means the act of making or crafting, but more generally it refers to the diverse collection of processes and knowledge that people use to extend human abilities and to satisfy human needs and wants. (ITEA, 2000, p. 2)

Technological literacy: **The ability to use, manage, assess, and understand technology**. A technologically literate person understands, in increasingly sophisticated ways that evolve over time, what technology is, how it is created, and how it shapes society, and in turn is shaped by society. He or she will be able to hear a story about technology on television or read it in the newspaper and evaluate the information in the story intelligently, put that information in context, and form an opinion based on that information. A technologically literate person will be comfortable with and objective about technology, neither scared of it nor infatuated with it. (ITEA, 2000, p. 9)

3. Philosophy of Technology Education

> Missouri's technology education profession affirms that its programs should teach about technology and use technology education in a way that serves as a vehicle to build understanding, skills, and attitudes that can be applied to society in general, regardless of career aspirations. Furthermore because all people are affected by technology, and because of technology's increasing presence in our lives, students from kindergarten to twelfth grade should be involved with learning about and learning to use technology. It is therefore recommended that a K-12 technology literacy program be in place in the state of Missouri to insure high school graduates are technologically literate.

Our world will be very different 10 or 20 years from now. We have no choice about that. We do, however, have a choice whether we march into that world with our eyes open, deciding for ourselves how we want it to be, or whether we let it push us along, ignorant and helpless to understand where we're going or why. A technological literate society will make the difference (ITEA, 2000, p. 10).

Technology and Industry

But what is technology? Simply stated, it is human kind's use of tools, machines, materials, processes and energy to satisfy its wants and needs. As such, it is not the search for an explanation of why things work - that is science. Nor is technology merely applied science - because often it precedes scientific knowledge.

Technology is knowing "how" to do something with tools, machines, materials processes and energy - and then it necessarily involves being able to do. Mere knowledge is not sufficient. Rather, technology is a combination of knowledge, skills and attitude that is always more powerful than any single component.

Industry is one of human kind's basic institutions. As such, it parallels that of government, church, and education. It is that institution that supplies our civilization with goods and services to fill our wants and needs. It does so by using technology. The technology used by industry is typically referred to as industrial technology.

Social Context

Contemporary and future society are clearly different from what America experienced during its first industrial revolution. To be sure, some elements of the industrial revolution remain, but many more have changed. Technology as a force has affected most aspects of our life, and thus technology seems to be the single most distinctive characteristic that sets today and the future apart from our past.

Evidence of this is seen in the literature. Note, for example, the frequent references to the *post-industrial* society, to the demise/reduction of *smoke stack* industry and to the *information* society. Furthermore, we have seen tangible evidence of such shifts in our automotive, steel, petroleum and electronics industries.

Technology as a Force Has Affected Most Aspects of Our Lives

Business and industry have been required to grapple with technology engendered issues such as productivity, technological capability and global competitiveness. Their workers have been challenged to retrain to develop currently marketable skills—in cognitive, affective and psychomotor domains—in order to maintain their ability to support themselves and contribute to our free-enterprise economy. Furthermore, with technology's advances, America's workers find these skills to be constantly changing.

Legislators have also been pressed to understand technology and its effects as they work to frame policies for the public good. With the rampant escalation of both the amount and complexity of technology, it is increasingly difficult for people to exercise appropriate citizenship functions, particularly given the curtain of confusion raised by technology and its media offspring.

Consequently, citizens have often found themselves bewildered by increasingly complex consumer decisions. Frequently they face decisions involving trade-offs between immediate gains and negative consequences, e.g. the effects of toxic wastes. Similarly, recreational environments and activities have increasing technological components, as do personal and societal learning activities.

Technology's pervasive influence has permeated even our homes. Our lifestyle is timed, microwaved, accelerated, recorded, computerized and confounded. A greater proportion of people are working, families are resorting to schedules to program their contact, and others are unemployed due to technological advances. Outside knowledge is pouring into the home via cable television and other media. Not infrequently the tensions from external aspects of life, many of which are technologically induced, do come home in the form of stress.

Even in social service arenas such as the health sciences, technological capabilities have caused us to ponder when enough is enough. We ask, for example, to what end do we operate life support systems in situations currently deemed hopeless?

Implications for Education

Given the pervasive nature of technology, the technology education profession raises the question: ***"Where do people develop the understanding, skills and attitudes to deal with forces such as technology?"*** This guide's response is straightforward. Clearly our society uses formal schooling as a principal method to this end—at least for youth, and in increasing numbers, for adults.

It follows then that one must ask, ***"What are the schools doing to help youth and adults address technology's challenges?"*** What systematic efforts are in place to develop technologically appropriate understanding, skills, and attitudes in elementary, secondary, post-secondary, adult and continuing education?

This guide presents an overview of how Missouri has addressed this responsibility—directly, efficiently, and effectively through its TE program! To this end, the Missouri Technology Education Guide is intended to be the state's primary resource for planning, implementing and evaluating technology education programs. Therefore it provides guidelines for the organization, instruction and management of Technology Education programs and associated student organization [e.g., Technology Student Association (TSA)] activities. The guide also directs technology education educators to references where they can find additional information. The Guide was developed to meet the needs of teachers and administrators by presenting highlights of the best thinking and practice supportive of efforts to create exemplary programs that help Missouri's youth learn about their technological world.

TE's Relationship to Vocational and General Education

Given the context described in the previous sections, it is clear that TE must be an essential component of BOTH general education, and career and technical education (specialized). Only in this way can technology education:

1. Serve as the component of general education that develops generalizable understandings, capabilities, values and attitudes related to technology in all youth.
2. Serve as a component of specialized education that contributes to meaningful occupational choice and/or preparation in a technological society.

Because of these dual dimensions and because of TE's approach, it has an essential role in helping build the base that leads to successful articulation plans such as Tech-Prep and/or 2+2 or 2+2+2 programs. Professional leaders need to be alert to opportunities to further the program's contributions to Missouri's youth as enabled by the Carl D. Perkins Vocational and Applied Technology Education Act.

The Profession's Name

Technology, industrial technology and industrial arts educators have, since at least 1904, addressed the content of industry. More recently, since the late 1970's there has been considerable professional impetus to redefine the subject as dealing with *technology* instead of with industry. Technology is viewed as more broad than industry or even

industrial technology. The core of our instruction focuses on the basic skills and understandings of technology.

This guide is dedicated to helping Missouri's technology education programs reflect technology, industry, and professional practice with greater fidelity.

Technology is broader than industry or industrial technology.

Content

Technology education draws its content from the entire range of technological endeavor, not just industry. Content is also selected by identifying the competencies individuals need to effectively use the products of a technological society.

Given the preceding philosophy and foundation, it is clear that the educational program known as technology education derives its content, i.e. the subject matter it teaches, from technology, and not just industry. It is considered to be a body of knowledge or a discipline.

Industrial technology is a subset of technology and much of it can be generalized to technology. To clarify, note that:

1. Technology consists of all human productive endeavors including agriculture, bio- and medical technologies.
2. Industrial technology is the technology that is used by industry. As such, industrial technology coexists with agricultural and other technologies.
3. Industrial technology consists of three technology system clusters: Materials & Processing, Energy & Power, and Communication.
4. Industrial technology education focuses on the technology of industry.
5. Technology education focuses on all of the technologies used by human kind.

4. Mission and Goals of TE

Since industry and technology are distinctive characteristics of American culture, and since one of the key purposes of education is to transmit the culture to future generations, it follows that it is necessary for the schools to provide youth with an insight into, an understanding of, and selected capabilities with, the technological nature of this society. Industry and technology spring from the human ability to reason, solve problems, create, construct, and use materials, tools, machines and processes imaginatively. Because these abilities are an integral part of our technological culture they should be developed in all students—regardless of their gender, background, educational goals or occupational aspirations.

The overarching mission of TE as a school program is to develop the human potential of all students for responsible work, citizenship and leisure roles in a technological society. To accomplish this, programs must address each of its three primary missions, namely to:

1. Develop each person's ability to comprehend and apply the concepts of technological systems.
2. Develop each person's values and attitudes related to the appropriate use of technology—its tools, machines, materials, processes, and products.

3. Develop each person's ability to use materials, technological processes and hardware to achieve constructive work skills and enhance occupational opportunity.

TE addresses these three primary missions by purposefully working toward an important set of goals. Simply put, this means that every student participating in any technology education program should experience a systematically designed program of instruction and activity that accomplishes each of the 14 goals presented in Figure 1-1.

TE also operates within the context established by the national *Standards for Technological Literacy: Content for the Study of Technology* and the *Missouri ShowMe Standards*. TE is particularly capable of addressing the ShowMe Process Standards. By articulating carefully to such goals, TE instructors can enhance the perceived value of their programs and they can increase the program's contribution to youth. The Standards articulation charts included in Chapter 2 facilitate this task.

Figure 1-1
Missouri Technology Education Program Goals

Every Student participating in technology education will experience a systematically designed and delivered program of instruction and activity that addresses two broad goals:

I. Understand and experience technology's creation, application, and control.
II. Understand and develop ways of thinking about technology that consistently respect the environment, promote human well-being, and benefit society.

Consistent with these two goals, technology education programs in Missouri enable students to:

1. Understand why and how people design, engineer, and innovate to meet human needs and wants.
2. Apply ways of thinking and doing essential to designing and problem solving, developing, making, managing, and assessing technological systems in various contexts.
3. Safely use, manage, and evaluate technological systems and engineering processes.
4. Relate technology with science, mathematics, and other subjects to understand systems in different contexts and to engineer solutions to practical problems.
5. Communicate technology content and processes, individually as well as in teams.
6. Understand the historical and future significance of engineered designs and impacts of technological solutions.
7. Develop basic skills in the safe use of tools, machines and processes used by industry and other technologies.
8. Foster creativity in using technology for desirable purposes by encouraging students to create, from materials and with technological processes and hardware, new and different forms which have greater or alternative value.
9. Facilitate the discovery of individual talents, aptitudes, interests and potentials related to technology through laboratory activity.
10. Encourage cooperative attitudes, constructive work habits and other traits that will help secure and maintain employment.
11. Develop pride in work done well.
12. Develop consumer skills related to the appropriate production, consumption and maintenance of technological goods and services.
13. Develop an awareness of and appreciation for career paths and opportunities in technology and engineering, and prepare for entrance into advanced secondary and post-secondary career and technical programs by promoting the development of a basic foundation of occupational skills and interests.
14. Develop leadership skills through student organization activity.

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